REMARKS

The Rejection

Claims 27-59 are rejected under 35 USC 112, second paragraph, as being indefinite. The Examiner points to claim 27, line 3 with respect to both expressions "the majority of" and "the boundary surface of said cell" which do not have proper antecedent basis and claims 28-59 which are dependent on claim 27 fall therewith.

Claims 27, 28, 30, 42-49, 51, 52, 54-59 are rejected under 35 USC 103(a) as being unpatentable over Gordon (US 4,177,330) in view of Kilby (US 2003/0180612).

Claims 29, 31-41 and 50 are rejected under 35 USC 103(a) as being unpatentable over Gordon ('330) and Kilby ('612) and further in view of Kinsmen (US 4,098,965).

Claim 53 is rejected under 35 USC 103(a) as being unpatentable over Gordon ('330) and Kilby ('612) and Kinsmen ('965) and further in view of Rapeli (US 6,103,417).

The Claims

Independent claim 27 as amended reflects principally the double frame wafer cell embodiment of the invention shown in Figs. 1A to Fig. 4B.

Claims 27-59 have been examined. Claims 48 and 53 have been canceled. Independent claim 27 has been amended to

include the subject matter of claim 48 directed to definition of the cathode assembly and cathode frame. Accordingly, claim 48 has been canceled. Independent claim 27 recites that the anode current collector sheet contacts the anode and the cathode current collector sheet contacts the cathode. Independent claim 27 has been amended herein to recite that the anode frame and cathode frame both comprise plastic material and that the anode current collector sheet and cathode current collector sheet both consist essentially of metal. Independent claim 27 as amended now recites that the anode currently collector sheet consisting essentially of metal is bonded directly to said anode frame comprising plastic and the cathode current collector sheet consisting essentially of metal is bonded directly to said cathode frame comprising plastic.

Argument Against The Rejection Under 35 USC 112

The Examiner has rejected claims 27-59 under 35 USC 112, second paragraph because of objection to particular phrases in independent claim 27. The Examiner has objected to the phrases "the majority of" and "the boundary surface of said cell" as recited in independent claim 27, which do not have proper antecedent basis. Applicant has now amended claim 27 to include proper antecedent basis for the term "boundary surface". Thus claims 27 now recites: "A primary wafer alkaline cell comprising a negative and a positive terminal, an outer boundary surface covering said cell, and a pair of opposing sides comprising at least the majority of said boundary surface..." It is believed the amended independent

claim 27 now includes proper antecedent basis for the term "boundary surface" so that the claim language is clear. The claim as a whole particularly points out the invention. The rejection of claim 27 and dependent claims 28-59 under 35 USC 112, second paragraph is now believed traversed. Withdrawal of this rejection is requested.

Discussion of the References

Gordon (U.S. 4,177,330) discloses a flat thin battery comprising a plurality of cells, wherein the cells are stacked and connected in series. Each cell, for example typical cell 8a, has but a single plastic frame 3a (vinyl material). The plastic frame 3a holds within its open core, a cathode slurry layer 16a, and anode layer 23a with separator 10a (cellophane) therebetween. There is a gelled electrolyte layer 20a between the anode layer 23a and separator 10a. The cathode layer 16a lies on the opposite side of the separator 10a. The anode may comprise zinc; the cathode may comprise MnO_2 and the electrolyte may comprise potassium hydroxide or mixture of ammonium chloride and zinc chloride. (col. 4, lines 34-38). There is a conductive plastic sheet 22a, which may serve as the anode current collector, overlying and in direct contact with anode layer 23a. The conductive plastic sheet 22a also serves as an intercell connector, thereby connecting the individual cells in series. Similarly, there is a conductive plastic sheet 15, which serves as the cathode current collector, underlying and in direct contact with the cathode layer 16a. (Conductive plastic sheet 15 is bonded to plastic frame 3a with adhesive 2a.) **It is specifically stated in Gordon ('330) that the conductive plastic forming the cathode current collector sheet 15 is a conductive**

plastic such as Condulon film as made by Pervel Industries. The Condulon film is a vinyl film made conductive by the inclusion of carbon black. (col. 4, lines 62-68) By inference the conductive plastic sheet 22a (anode current collector) is of the same conductive plastic material. It is this conductive plastic material, namely conductive plastic sheets 15 and 22a, which is bonded to plastic frame 3a. There is no disclosure or intent expressed in Gordon ('330) of employing a metallic current collector sheet to be bonded to a plastic frame. It is believed that the plastic conductive (non-metallic) current collector sheets 22a and 15 are employed instead of metallic sheets because it is far easier to bond plastic to plastic rather than plastic to metal. In particular it is observed in Gordon ('330) that both frame 3a and conductive plastic sheet 15 are of the same base material, namely vinyl plastic, which makes bonding of these materials to each other easier. However, the disadvantage in employing such conductive plastic materials for the anode and cathode current collectors is that their conductivity is much less than metal.

Kinsman (U.S. 4,098,965) is a thin flat battery disclosing a number of features which are the same or similar to those disclose in Gordon ('330). Each cell, for example, is composed of an anode layer such as 17a, a cathode layer 9a with separator sheet 14a therebetween. However, one main difference is that Kinsman utilizes a dual plastic frame, e.g., composed of frames 11a and 12a with common central opening for holding the anode layer 17a and cathode layer 9a and separator 14a therein. These plastic frames 11a and 12a can be bonded together by heat sealing. (col. 3, lines 55-59). A specific separator 14a is disclosed as cellophane. There is a gelled electrolyte layer 15a

between anode 17a and separator 14a. As indicated in the examples the anode may comprise zinc and the cathode may comprise manganese dioxide. The electrolyte employed is an aqueous alkaline mixture. Alternatively, the electrolyte may be a mixture of ammonium chloride and zinc chloride (Leclanche electrolyte). There is an outer film layer of polyethylene or polyvinylchloride wrapped around the battery. The material mentioned for plastic frames 11a and 12a is a polyamide material which can be readily bonded to cellophane separator 14a. (Frames 11a and 12a may be composed of fibrous nonwoven material filled with polyamide resin.) As in Gordon '330 there is no disclosure or intent expressed in Kinsman '965 to employ a metallic current collector sheet to be bonded to plastic frame material. Instead the anode current collector sheet 16a (intercell connector) in Kinsman is of conductive plastic material and said conductive plastic sheet 16a is bonded to plastic frame 11a. Similarly, the cathode current sheet 8, which is expressly of a conductive plastic material, is bonded to plastic frame 12a. **The conductive plastic material for cathode current collector sheet 8 is described in Kinsman ('965) as a carbon filled thermoplastic material, preferably a carbon impregnated vinyl film sold under the trade designation Condulon film from Pervel Industries. (col. 3, lines 6-16).** The cathode conductor sheet 8 of carbon filled vinyl film is in direct contact with cathode layer 9a as shown in Fig. 8. Cathode conductor sheet 8 in turn is in contact with metal positive terminal 7. However, as shown in the figures there is no metal sheet in contact directly with cathode layer 9a and certainly there is no metal current collector sheet bonded to plastic frame 12a. Similarly the anode current collector sheet 16a (intercell connector) is also of carbon filled thermoplastic material, preferably carbon filled vinyl (Condulon film). (col. 5, lines 3-6) This carbon filled plastic

material 16a is in direct contact with anode layer 17a. However, there is no metal sheet in direct contact with anode layer 17a and certainly there is no metal sheet bonded to plastic frame 11a.

In sum there is no metal sheet in direct contact with either anode layer 17a or cathode layer 9a and there is no metal sheet bonded to a plastic frame material in the thin, laminate alkaline cell shown in Kinsman ('965). Instead the carbon filled plastic sheets 16a and 8 are bonded to plastic frame 11a and 12a, respectively. Thus, the anode and cathode current collector sheets, e.g., sheets 16a and 8, respectively, are carbon-filled plastic. This makes it easier to bond the peripheral edges of these current collector sheets to the plastic frames 11a and 12a, respectively, than if said current collector sheets were of metal. However, the disadvantage in employing such conductive plastic materials for the anode and cathode current collectors, is that their conductivity is much less than metal.

Kilby (U.S. 2003/0180612) is directed to alkaline cells having anode comprising zinc, cathode comprising manganese dioxide and alkaline electrolyte, which includes potassium hydroxide. The invention is directed to improving high rate discharge by employing an electrolytic manganese dioxide having a pH voltage of at least 0.860 volts. The reference describes that the high rate discharge may be further improved by using electrolytic manganese dioxide having less than about 250 parts per million (ppm) of potassium impurities by weight. It is stated generally: "The cell may have essentially any construction. For example, the electrodes may have a bobbin-

type, spiral-wound, stacked (i.e., jelly roll) or any other construction." Para. 39, lines 3-6. (Bobbin-type as the term is used in the art reflects configuration as in the conventional cylindrical alkaline cell, wherein an electrode occupies a specific region within the cell interior.) The above statement that "the cell may have essentially any construction" is general and made in passing with no specific cell configurations described or shown in the reference. In particular there is no embodiment of a wafer type, laminar cell disclosed in this reference. There is no discussion in this reference which is directed to any specific construction of the wafer type cell.

Arguments Against the Rejections Under 35 USC 103

The Examiner has rejected claims 27, 28, 30, 42-49, 51, 52, 54-59 under 35 USC 103(a) as being unpatentable over Gordon (US 4,177,330) in view of Kilby (US 2003/0180612).

The Examiner has rejected claims 29, 31-41 and 50 under 35 USC 103(a) as being unpatentable over Gordon ('330) and Kilby ('612) and further in view of Kinsmen (US 4,098,965).

The Examiner has rejected claim 53 under 35 USC 103 as unpatentable over Gordon ('330), Kilby ('612) and Kinsman ('965) and further in view of Rapeli ('417). Claim 53 has been canceled herein rendering this rejection moot.

Gordon ('330) and Kinsman ('965) both disclose a wafer type cell which are composed of a plurality of thin flat cells connected in series. Anode material comprising zinc and cathode

material comprising manganese dioxide for use in the cells are disclosed. Each cell in Gordon has only one plastic frame, e.g. plastic frame 3a, for housing the anode and cathode material. Kinsman ('965), discloses each cell having dual plastic frames, e.g. plastic frames 11a and 12a, which are bonded together. In Kinsman ('965) the anode and cathode material are housed within the central opening of these bonded frames.

Neither Gordon '330 nor Kinsman '965 discloses or contemplates the use of metallic current collector sheets which are bonded directly to an anode plastic frame or cathode plastic frame. As above described both Gordon and Kinsman employ anode and cathode current collector sheets which are formed of a conductive plastic material, specifically a carbon filled thermoplastic. Such carbon filled thermoplastic material is shown in Gordon ('330), for example, as the cathode current collector sheet 15 which is bonded directly to plastic frame 3a employing adhesive 15. Similarly, the carbon filled thermoplastic material is shown in Kinsman ('965) as cathode current collector sheet 8, which is bonded directly to plastic frame 12a. It is much easier to bond plastic to plastic than plastic to metal. The cathode current collector sheets of Gordon or Kinsman are essentially plastic sheets which are bonded directly to the plastic frame. There is no disclosure or contemplation in either of these references for the use of a metallic cathode current collector sheets to be bonded to plastic frame material. Similarly, there is no disclosure or contemplation in either of these reference for the use of a metallic anode current collector sheet to be bonded directly to plastic frame material.

By contrast Applicant employs a metallic cathode current collector sheet 80 which is bonded directly to plastic cathode frame 70 (Fig. 4B). Applicant employs a metallic anode current collector sheet 20, which is bonded directly to plastic anode frame 30 (Fig. 4A). The completed cell embodiment is shown in Applicant's Fig. 2. It is indicated, for example, that the anode current collector sheet 20 (Fig. 4A and Fig. 2), preferably of copper, is adhesively bonded to the anode plastic frame 30. (See Applicant's specification, p. 22, lines 9-26). It is indicated that the cathode current collector sheet 80 (Fig. 4B and Fig. 2), preferably of nickel or nickel plated steel, is adhesively bonded to cathode plastic frame 70. (Applicant's specification, p. 23, line 24 to p.24, line 21.) Other metals for anode current collector sheet 20 and cathode current collector sheet 80 are indicated in Applicant's specification at p. 9, first and second full paragraphs. The carbon filled plastic material disclosed in Gordon ('330) or Kinsman ('965) can allow gradual penetration of electrolyte therethrough causing gradual weeping of electrolyte as it passes to the opposite side of the carbon filled plastic material. This may ultimately cause the seals to deteriorate. By contrast Applicant's metallic current collector sheets do not allow electrolyte to pass therethrough and are thus far more resistant to attack by electrolyte. By employing such metallic current collector sheets (e.g. sheets 20 and 80) Applicant also achieves much better electrical conductivity than is possible with the carbon filled thermoplastic material disclosed in Gordon ('330) or Kinsman ('965).

Applicant maintains that it is not obvious that a wafer alkaline cell, of laminar construction as in Figs. 4A and 4B

(also shown in Figs. 1A and Fig. 2) can be successfully constructed utilizing a metallic anode current collector sheet 20 which is bonded to a plastic anode frame 30 and a metallic cathode current collector sheet 80, which is bonded to a plastic cathode frame 70. This is because bonding of metal to plastic sheets in a wafer alkaline cell would be considered untenable or unreliable, particularly in view of hydrogen gassing which can occur during cell discharge or storage.

The reference Kilby ('612) is cited for disclosing alkaline cells with anodes comprising zinc, cathodes comprising manganese dioxide. But as above described Kilby does not show any cell construction which is of the wafer type or of any type having thin flat, laminar construction. Therefore Kilby cannot render obvious the cell structural features as now recited in Applicant's amend independent claim 27.

Accordingly, since neither Gordon ('330) nor Kinsman ('965) disclose or suggest a metallic cathode current collector bonded to a plastic frame, it is believed that these references when viewed alone or in combination, even in view of the added reference Kilby ('612), cannot render obvious Applicant's invention as defined in amended independent claim 27.

Specifically, the rejection of independent claim 27 under 35 USC 103 as unpatentable over Gordon ('330) in view of Kilby ('612) is traversed, inter alia, since Gordon ('330) does not disclose or suggest a metal cathode current collector sheet bonded to a plastic frame in the context of a wafer alkaline cell. Kilby (612) does not disclose any specific cell

construction for wafer alkaline cells or cells having thin flat laminar construction. The use of a metallic cathode current collector bonded to a plastic frame in the context of an alkaline wafer cell construction as defined in Applicant's amended independent claim 27 is believed unobvious. Such construction is not disclosed in either Gordon or Kilby. The rejection of independent claim 27 under 35 USC 103 is believed traversed and withdrawal of this rejection is respectfully requested.

Similarly, any rejection of amended independent claim 27 as unpatentable under 35 USC 103 on the basis of Gordon ('330) and Kilby ('612) and in view of Kinsman ('965), whether these references are viewed alone or in any combination is believed traversed. As above indicated Gordon ('330) and Kinsman ('965) disclose cell construction for thin flat cells which may employ zinc anodes and manganese dioxide cathodes. However, none of these cited reference discloses or suggests the use of a metal cathode current collector which is directly bonded to a plastic frame in the context of a wafer alkaline cell. Accordingly, Applicant's amended independent claim 27 is believed patentable over these references, whether viewed alone or in any combination. Withdrawal of any rejection of amended claim 27 and claims dependent thereon as unpatentable under 35 USC on the basis of Gordon ('330) and Kilby ('612) and further in view of Kinsman ('965) is requested.

It is believed that the missing information in Gordon ('330), or Kinsman ('965), or Kilby (612) namely, the use of a metallic cathode current collector sheet bonded to a plastic

frame in the context of a wafer alkaline cell as defined in Applicant's amended claim 27, would have to be supplied from Applicant's disclosure. Such hindsight analysis is inapplicable. See, e.g., Grain Processing Corp. v. American Maize-Products Co., 5 USPQ2d 1788, 1792 (Fed. Cir. 1988). See also, In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). To support a rejection under 35 USC 103 the references must provide a basis within their own teachings and not the teaching of Applicant's application.

Dependent claims 28-47 and 49-52 and 54-59 reflect specific embodiments of the invention, which further narrow the scope of independent claim 27. These dependent claims should be allowable if the amended main claim 27 is allowed.

Applicant encloses herewith a set of formal drawings Figs. 1-9C (11 sheets) with separate letter addressed to the Examiner.

Applicant has made every effort to place the application in condition for allowance. Allowance of the Application upon reconsideration is respectfully requested.

Authorization is hereby given to debit Deposit Account 502271 for any amount owing or credit the same account for any overcharges in connection with this communication.

Date: Feb. 11, 2008

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